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DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XVI April 15, 1932 Number 5

DISEASES OF VEGETABLE CROPS

AN UNUSUAL OUTBREAK OF CELERY EARLY-BLIGHT

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During the winter season of 1931 and 1932 the celery-growing region of Sanford, Florida, was visited with exceptionally warm temperatures. Although rainfall was below normal, the relative humidity was apparently very high, and dew collected in the fields practically every night, which is unusual. Under these conditions occurred one of the most serious infestations of Cercospora apii Fres. on celery ever encountered in the Sanford region. As the writer has worked in Sanford but two winters, his personal knowledge of the crop there is necessarily limited. However, well informed growers who have been in the business since its inception agree that the blight was the worst they had ever seen.

At the beginning of the season the disease soon appeared to be most serious in certain fields. The seed beds from which the worst-diseased fields were planted were examined. Though they had all been sprayed with Bordeaux mixture, Cercospora spots were easily found on the leaves. However, the plants as a whole did not look too seriously affected to plant. As soon as the seedlings showed signs of being settled in the field and new leaf growth had developed, Cercospora lesions were found in abundance and the trouble spread rapidly from field to field. Spraying was begun sooner than usual after the seedlings had been transplanted.

"Blight weather," according to the Florida celery farmer, consists of rainless periods accompanied by gentle eastern trade winds, in which the days are bright and warm, the nights slightly cool, the dews heavy and not drying off the plants until nearly noon. It is a condition in which the very dry weather, from the standpoint of precipitation, is very wet weather, from the standpoint of water collected and held on the plant surfaces. Blight weather, as described, occurred almost continuously in the Sanford region during the whole of the celery growing season just closing (March, 1932).

No fields were free from Cercospora blight, though some were better than others. Three outstandingly good fields were noted, with badly diseased fields all about them. These had all been sprayed consistently about every 4 to 8 days. One man had used liquid Bordeaux spray (4-4-50 formula), another had used copper-lime dust interspersed with the usual liquid Bordeaux, and the third had used the 4-4-50 Bordeaux mixture varied by the addition of 2 quarts of full-strength liquid lime-sulphur. On some of the most seriously affected fields farmers reported the use of 16-24-50 Bordeaux mixture. In some cases soaps and oils were also added. Unfortunately the writer was not present when some of these extreme variations in the formulae were being made up or applied. Such fields appeared to be more than ordinarily thickly coated with Bordeaux. The successful growers in this region have no rule-of-thumb method of determining the period between sprayings. It depends on weather, the appearance of the disease, and the growth of the plants. During parts of the season some farmers sprayed as often as once a day, sometimes double spraying where the disease was unusually bad. The average period between sprayings was about seven days.

The bad effects of the serious blight attack were of six kinds: (1) The most obvious effect was the blemished leaves and petioles, which result in bad appearance and quality of the product. (2) Later, as the lesions progressed, they were attacked by saprophytic fungi such as Alternaria, Botrytis, etc. These served to complicate diagnosis of the troubles on the diseased plants. They were not found attacking unblighted plant surfaces, however. (3) The third effect was an inderect one. Leaf lesions cut down, materially, the photosynthetic surfaces. Recalling how, in the past, their crop had responded to fertilizer treatment, many growers set to work to reclaim their crop. They sprayed the diseased leaves well and gave the plants an added amount of fertilizer. The soil was warm, irrigation water was plentiful, the plants, however, grew slowly, and it appeared as a result of heavy fertilization that the root systems were badly injured, after which decay set in. (4) Some injury was caused to the crop by the continual driving of spray machines up and down the rows,

thereby bruising leaves, packing the ground between the rows, and occasional plants being stepped on by draft animals. (5) A very definite bad effect of the unusual amount of Cercospora blight was the apparent necessity for the use of unusual quantities of fungicidal materials. Estimates vary as to quantities applied, but it is likely that the amount used was probably at least one-third more than under ordinary conditions. With the lowered prices paid by the consumers for farm products and the marked reduction in yield due to the unfavorable growing conditions and the presence of badly blighted plants, growers could ill afford to pay what it cost them to apply excessive amounts of Bordeaux mixture. (6) The sixth ill effect, noted by the writer, was the psychological effect on the growers. In many other parts of the United States, farmers are as badly off financially, but in this district for the first time some of the growers encountered the blight under conditions that would not yield to the control measures which had always heretofore been effective.

It is impossible to make an estimate on the losses due to Cercospora blight this year. Many farmers plowed up part of their crop because they considered it unfit for harvest on account of the disease.

POTATO LATE BLIGHT IN TEXAS

The following statement concerning the occurrence of late blight (Phytophthora infestans) in the lower Rio Grande Valley of Texas this year was sent by W. J. Bach in a letter to R. J. Haskell.

"The disease made its first appearance in the lower part of the Valley about January 20. Between January 20 and 25, specimens were brought to the station from a field of well advanced potatoes, which had been planted from clean seed. Vines were also brought in from plants that had come up as a volunteer stand in a field that had been killed by blight last season. The damage last year in this field was so severe that no potatoes were dug, and consequently, the volunteer stand came up severely infected this season. Fortunately, our weather conditions this spring were unfavorable for the development of late blight and it did not become serious in any field that I know of (not considering this volunteer field which I just mentioned). I have made several trips through the potato section, in order to check the prevalence of various diseases, and although late blight could be found to a slight extent on most trips, it was by no means common or severe.

"Early blight (Alternaria solani) developed about the first of

February and did become very severe, however. In fields where a regular program of spraying with 4:4:50 Bordeaux or dusting with copper lime dust was practiced the disease was very well controlled, although not eliminated.

"On the nights of March 13 and 14, we had a rather severe frost which killed or very seriously injured all the potato vines in the Valley. Since that time I have had no further inquiries. The weather, however, has continued dry and I would not expect any new developments in particular."

F R U I T D I S E A S E S

FREEZING INJURY TO FRUIT IN ILLINOIS

Following an unusually mild winter, the extreme cold weather of the first week in March caused damage to fruit buds especially in the region from Virginia and Ohio west to Missouri and Arkansas. The report by H. W. Anderson from Illinois is the only detailed report received thus far.

"The latest information seems to indicate that about 90 to 95 per cent of the Elbertas are killed throughout the principal peach growing area of the State. Since this is their chief variety, of course, the peach crop will be almost a total loss. The next most important variety, the Hale, shows up much better. In many orchards as many as 20 per cent of the fruit buds are alive. I would estimate that throughout the State the orchards are planted about 80 per cent Elberta to 20 per cent Hale. Other varieties would constitute only perhaps about 5 per cent of the total acreage. I would judge that we will not have more than 5 per cent of the peaches that were shipped last year. A great many orchardists feel that they have not sufficient fruit in the orchard to warrant spraying.

"Apples were also very seriously injured. In general, all the early varieties are killed. These include Duchess and Transparent, which constitute about 80 per cent of the early varieties. Grimes was perhaps the most seriously injured of the summer varieties. Jonathan seems to have fared somewhat better. As far as I have been able to learn, the late varieties have not been very seriously injured.

"Practically all pears have been killed, as well as most of the plums." (April 5).

APPLE SCAB

Pennsylvania: The recent storm has delayed our fruit spraying activities about ten days. We find apple scab fungus spores just being formed. (George L. Zundel, March 19).

Illinois: Mature scab perithecia were found at Urbana, Illinois, on February 29. The number of asci with mature ascospores indicated that these had been matured at a much earlier date. Out of 25 perithecia examined, all but two had brown ascospores on the above date and fully 25 per cent of the asci showed ascospores formed. In 1931 mature ascospores were observed on February 27, but the number of brown spores was much less than this season.

Scab perithecia are very abundant. No difficulty is experienced in finding leaves showing perithecia, although scab was not serious in 1931. However, scab was unusually prevalent on the leaves late in the season and the leaves were retained on the trees until November.

It will be interesting to see whether the early maturity of ascospores will influence the relative prevalence of scab. It is evident that heavy rains under present conditions would cause extensive expulsion of spores several weeks before the apple buds open. (H. W. Anderson, March 3).

Apple scab spores are, of course, not discharging during this cold weather but, so far as I can see, they are quite as abundant now as they were on February 28. However, I believe that there is no further development. (Anderson, March 17).

DISEASES OF THE LATHAM RASPBERRY IN ILLINOIS

H. W. Anderson

About six years ago the Latham variety of red raspberry was introduced into southern Illinois. Since the Latham originated in Minnesota, the new plantings were at least 600 miles south of the "home" of the variety. The problem of disease under these new conditions was of interest and the variety was closely watched for the appearance of diseases. Some of the facts are here presented in order to guide other pathologists who have to deal with this variety in new localities.

Surface Mildew (Sphaerotheca humuli). Until the introduction of the Latham variety, mildew was not known to occur in central or southern Illinois on raspberries. In 1931 a severe case of this disease was observed on Latham in Union county. It was identified by Dr. P. D. Peterson, who had had experience with this variety and

disease in Minnesota. It was found in only one plantation of eight or ten examined, but in this fully 75 per cent of the plants were diseased. At the time of examination (July 30) no evidence of the fungus itself could be found and the mottled leaves resembled mosaic for which it was mistaken when first observed.

Virus diseases. Most of the early plantings of Latham raspberry were from the carefully inspected nurseries of Minnesota. Inspections have been made of most of the plantings in Illinois at least twice a year. To date only one authentic case of mosaic has appeared and this was confined to one hill. A number of growers are now securing their plants locally, or increasing their own plantations from the older plantings. This practice may result in a more serious virus problem in the future.

Spur blight. A disease resembling spur blight has been observed commonly on weak canes for several years. The normal, vigorous canes appear to be practically free of this disease. The perfect stage of Didymella applanata (Mycosphaerella rubina) was found on canes from Alexander county and mature ascospores were observed on February 25, 1932. These discharged within four hours after the canes were moistened.

Cane blight (Leptosphaeria coniothyrium) is found commonly on old canes. Both the imperfect and perfect stages may be found at any season of the year. It has never been considered an active parasite under Illinois conditions on either the reds or blacks.

Leaf spot (Septoria rubi, Mycosphaerella rubi) is commonly found on the Latham but has not caused serious trouble even in wet seasons. It was observed causing serious defoliation in Arkansas in 1931.

Gray bark. The name "gray bark" has been applied to the disease caused by the spur blight organism. Since the term is not especially descriptive and since "spur blight" has priority, the name "gray bark" is here used as the common name of an apparently new disease of Latham.

In the early winter of 1929, our attention was called to a grayish coating of the raspberry canes in southern Illinois. An examination of these canes showed that the fungus causing the trouble was confined to the outermost layer of bark. On many of the canes the entire surface was covered for several feet. A further examination showed that the complex was made up of numerous fused lesions. A single lesion consisted of a grayish circular spot from an eighth to a half inch in diameter. On this lesion were numerous brownish spots resembling pycnidia. These were frequently arranged in a concentric manner. A microscopic examination revealed no spores but the fruiting bodies, if they were such, resembled acervuli rather than pycnidia. All attempts to produce spores under moist chamber conditions failed.

The disease was watched in the field during 1930, but the season was extremely dry and the disease failed to appear in the new canes. Little information could be obtained in regard to the effect of the fungus on the fruiting canes, because the drought was so severe that all raspberries were seriously injured. In general there did not appear to be any serious damage to the bearing canes since the fungus remained strictly superficial and the infected layer was mostly sloughed off early in the season.

No further observations were made until the fall of 1931 when a few canes were observed showing the gray spotting. Just when this infection occurred was not accurately determined, although the canes appeared to be free of the disease until the middle of August.

Attempts were again made to find the spores of the fungus by keeping the diseased canes under varying conditions but the results were again negative. So far as we have been able to determine no description of the disease has been published.

An intensive investigation of the disease is planned for the coming season. The object of this brief report is to get further information concerning the distribution of the disease. Specimens from other States are especially desired.

Leaf rust. In 1929 (Pl. Dis. Rpt. 13 P. 163) I reported a leaf rust as occurring in a severe form on a ten-acre patch of Latham in southern Illinois. This was ascribed to Kuehneola uredinis (Lk.) Arth. In 1931 W. D. Mills (Pl. Dis. Rpt. 15 P. 135) reported a similar severe outbreak in New York and called attention to the fact that wild raspberries nearby were also infected. Specimens were sent to Dr. F. D. Kern, who identified the rust as Pucciniastrum americanum. The similarity of the two outbreaks lead me to believe that they might be due to the same organism. Specimens from Illinois collected in 1929 were sent to Dr. Kern who stated that the rust was undoubtedly Pucciniastrum americanum.

Although practically every plant in the ten-acre plantation showed rust in 1929, no further trouble has been experienced by this grower and the disease has not been observed in any other Latham plantations.

CEREAL DISEASES

ANTHRACNOSE OF RYE IN KENTUCKY

"Specimens of rye were received December 22, 1931, from a field near Danville sowed late in August. Many leaves were dead. Rust was abundant. At the present time about three-fourths of the plants in the field are dead. Colletotrichum graminicolum is fruiting abundantly on the dead and dying plants, the crowns of the plants being blackened to quite an extent. The disease has evidently progressed throughout the winter as plants in all stages are now present in the field. At present the rye may be considered as completely ruined. Corn failed because of drouths in 1930; sowed to rye in fall, harvested good crop in '31; disced stubble in August and reseeded to rye. Anthracnose injury became evident in about six weeks." (W. D. Valleau, March 3).

DISEASES OF SPECIAL CROPS

DOWNY MILDEW OF TOBACCO

Since the last account in the Reporter (March 15) downy mildew (Peronospora hyoscyami) has spread throughout the Georgia and Florida tobacco belts, and has been reported definitely as causing serious damage in North and South Carolina.

It would seem that any check in its spread caused by the cold weather of the early part of March was only temporary.

The distribution to date is shown in the accompanying map (Fig. 1). Reports from the various States follow:

FLORIDA: A telegram received April 8 from L. O. Gratz gives the following counties - "Gadsden, Leon, Madison, Alachua."

GEORGIA: J. G. Gaines reported on March 20 - "A ten-day cold wave beginning March 6, apparently temporarily checked the activity of tobacco downy mildew in Georgia. However, symptoms were observed to appear in a limited number of plant beds (under cloth) during nights cold enough for frost. The severe freeze of March 10 killed a large percentage of plants in many beds. The majority of mature

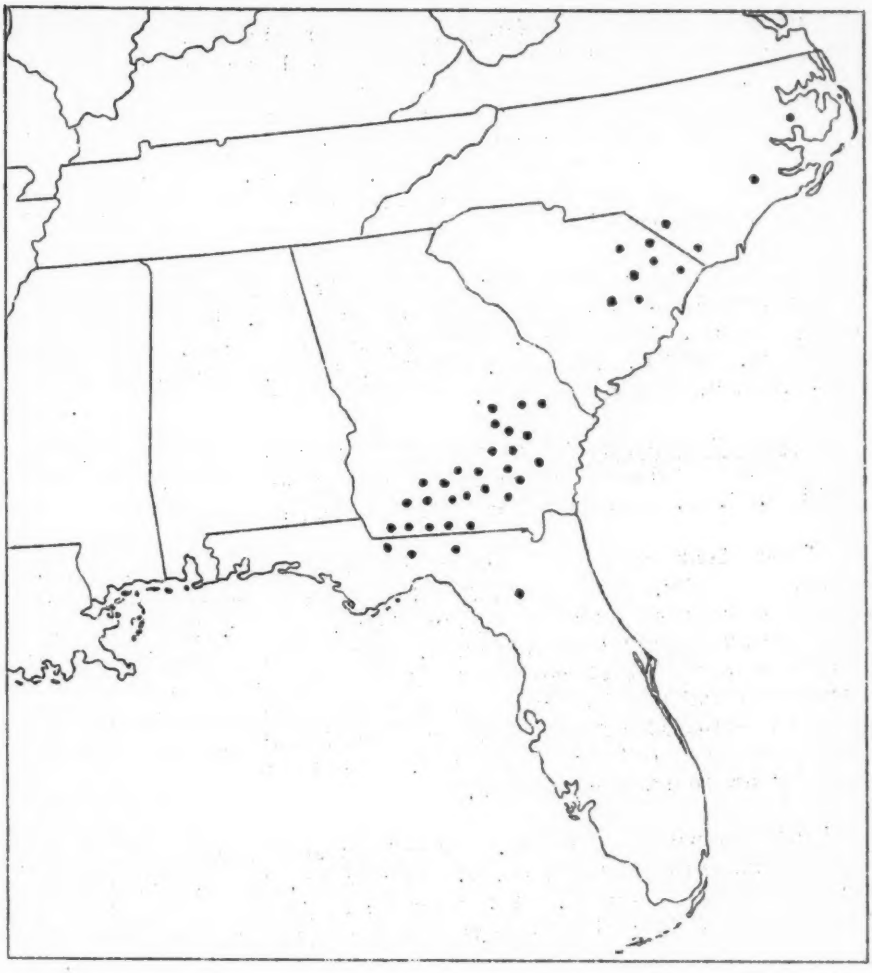

Figure 1. Counties in which tobacco downy mildew has appeared in 1932. (Based on telegrams received April 8, from George M. Armstrong, J. G. Gaines, L. O. Gratz, S. G. Lehman, and W. M. Lunn.)

seedlings were either completely frozen or killed to the ground. Since those plants not killed outright are beginning to recover (March 19), no definite estimate of freeze damage can now be made. Small seedlings suffered very little freeze injury. It was interesting to note that plants recovering from downy mildew were more subject to cold damage than those not affected. The period March 15 to 19 was comparatively warm and during this time outbreaks of downy mildew generally reappeared."

In a telegram dated April 8, he gives the following distribution for Georgia - "Tobacco mildew in Treutlen, Candler, Bullock, Tatnall, Toombs, Montgomery, Appling, Wayne, Pierce, Bacon, Ware, Jeff Davis, Coffee, Atkinson, Berrien, Irwin, Tift, Cook, Lowndes, Brooks, Thomas, Grady, Colquit, Mitchell and Worth Counties."

SOUTH CAROLINA: Since the March 15 issue of the Reporter, downy mildew of tobacco was found for the first time in South Carolina. On April 1, G. M. Armstrong wrote as follows:

"Our first authentic case of downy mildew of tobacco has appeared recently. Both Mr. Lutken and I had telegrams from Florence County this week about the disease in plant beds, and Mr. Lutken visited the section around Lake City and Olanta, Wednesday, March 30. He visited 17 plant beds, the first seven of which had been practically wiped out. The other ten had the infected areas varying from about one foot in diameter to one-half of the bed. The poorly drained parts of the beds seemed to be more seriously affected. The trouble has apparently been present for at least three weeks.

"On Wednesday afternoon, I received some specimens from Pamplico, in the eastern part of the county, whereas Mr. Lutken visited the western edge of the county. A telegram has just been received from the County Agent in Dillon County saying the trouble is there."

W. M. Lunn of the Division of Tobacco and Plant Nutrition wrote from Florence on April 5 that "During the last day or so the County Agents report the disease has spread to practically all the tobacco-growing counties of the State. Many beds have been wiped out entirely, and others seem to be going fast.

"I was out yesterday with the County Agent to see a number of beds. On one farm we saw a total of 14 beds, two gone entirely, ten dying in spots, and two apparently healthy. Saw a number of other beds which were more or less infested.

"Our beds here on the Station are all right so far, but I have been spraying with a fresh mixture of Bordeaux (4-4-50) every three or four days. Left one small area in one bed not sprayed but to present time no blue-mold in this area. If our plants escape think they will be ready for transplanting in about two weeks.

"As soon as the scare is over probably the County Agents in this section can give a fair idea as to the per cent of damage. From present indications, it seems that the damage to beds in the tobacco section of the State will be rather serious. I hear that eastern North Carolina is suffering about as much as they are down here."

The following telegrams give the most recent information (April 8).

"Finished tobacco survey with Lutken yesterday. Mildew in Clarendon, Darlington, Dillon, Florence, Horry, Marion, Williamsburg Counties. Two-thirds of plants destroyed in some beds visited. Disease apparently most recent in Clarendon, Williamsburg, and Darlington."(George M. Armstrong). (See also Page 55).

"Downy mildew has been found in every tobacco county in this State." (W. M. Lunn).

"Replied to your telegram today saying that downy mildew had been found in every tobacco growing county in this State. I might say further that according to information of my own, the reports from county agents in the tobacco growing counties, and reports from several individual farmers, this trouble has absolutely wiped out probably several hundred beds in South Carolina. I talked with a farmer yesterday who said at least half the tobacco beds in his section were dead and many of the others were still dying. There are some apparently healthy beds left, but no one knows for how long.

"I have been spraying our beds here on the Station every three or four days with Bordeaux 4-4-50 and so far blue mold has not appeared on our plants." (W. M. Lunn, April 8).

NORTH CAROLINA: On March 17, G. A. Meckstroth reported the finding of the disease in a bed at Chadbourn, in Columbus County, near the South Carolina line, as follows:

"Practically all the plants were killed out in an area about twenty-five feet long and twelve feet wide the width of the bed. This dying has been noticed for about two weeks but the grower failed to

get in touch with us until yesterday. They placed some boards in the bed, trying to check the advance of the disease, and so far as I can see, the plants beyond the boards are not diseased. Last week, however, the cold snap killed most of the plants in the entire bed and it will be a day or two before we can definitely say how many plants are left.

"This bed in question is a new bed, new poles, new canvas and everything and we are at a loss to know how the disease got started."

A telegram from S. G. Lehman (April 8) states:

"Downy mildew causing serious damage in Robeson, Columbus, Jones, and Washington Counties. Majority of plants killed back to bud on one large bed. No report from other counties but the disease probably causing damage in all counties Southeastern and Coastal areas where plants are near transplanting sizes."

DISEASES CAUSED BY NEMATODES

NEMATODES IN NARCISSUS

The following quotation is from a mimeographed leaflet (Narcissus inspection records for 1931) issued by the Plant Quarantine and Control Administration, March 22, 1932.

"Infestations with eelworms (*Tylenchus dipsaci* or *Aphelenchus subtenuis*) were reported in 1931 as to one or more plantings in California, Florida, Georgia, Illinois, Indiana, Kentucky, Michigan, Missouri, New Jersey, New York, North Carolina, Oregon, Tennessee, Virginia, Washington, and Wisconsin. In addition to the records for the year 1931, eelworms had previously been reported on properties in Alabama, Kansas, Mississippi, Ohio, Rhode Island, South Carolina, Texas, and Utah. Some of these properties have not since been reported as inspected and infestation may possibly still be persisting in them."

NEW HOSTS OF PLANT-PARASITIC NEMAS

Caconema radicicola on *Astragalus sinicus*, from Department of Agriculture greenhouses, Washington, D. C. Infestation heavy.

Caconema radicicola on Acer japonicum from Japan, intercepted at Department of Agriculture inspection house, Washington, D. C.

Caconema radicicola on Bignonia capreolata (crossvine) in Department of Agriculture greenhouses, Washington, D. C.

Neotylenchus abulbosus in black spots on leaves of Papaver orientale from England, intercepted in Washington, D. C.
(G. Steiner and Edna Bührer).

TOBACCO DOWNY MILDEW IN SOUTH CAROLINA

Letter received from George M. Armstrong, April 11. "Downy mildew has spread rapidly within the past week or ten days and was present in all the counties visited, which were Clarendon, Darlington, Dillon, Florence, Horry, Marion and Williamsburg. The greatest damage apparently has occurred in Florence County around Olanta and Lake City, the region from which the first reports were received on Tuesday, March 29. Two-thirds of the plants were destroyed in the twenty beds inspected in this area. As best we could determine, every plant bed in a two-mile radius of Olanta was infected. County Agent Wells, estimated 30 per cent of the beds in Marion County to be infected. From what we saw in other areas, I suspect his estimate to be considerably low. Mr. Lutken went alone to Horry County and saw ten beds to the north of Conway, all of which were infected.

"Mr Lazar, the District Agent, was in the region around Aynor the previous day and found 75 per cent of the beds infected. In Dillon County, Mr. Lutken found six of the nine beds he visited, to be infected with the disease and they were being seriously injured. Four of the seventeen beds seen in Darlington County were infected. Most of the beds inspected were on the edge of the tobacco belt in the Oates section, where no disease was found. We saw ten beds in Clarendon County in the region from Turbeville towards Kingstree, 5 or 50 per cent of the beds being infected. Relatively small areas of the beds were infected and these were in early stages, indicating a recent appearance of the disease. The County Agent in Williamsburg County took us on an 18 mile jaunt and we saw only three beds, one of which was showing the disease in an early stage. Mr. Meares, the teacher of agriculture at Hemmingway, stated that all beds in his community were infected.

"Except in the Olanta section, I did not see serious damage to beds, since the disease had not apparently been in the other sections very long. The extent of the damage in South Carolina will apparently depend upon the weather conditions the remaining two weeks before most of the plants would normally be set in the field."